

The University of Chicago

SIGNIFICANT FACTORS IN THE
PREDICTION OF THE SUCCESS
OF COLLEGE FRESHMEN

A PART OF A DISSERTATION SUBMITTED
TO THE FACULTY OF THE DIVISION OF
THE SOCIAL SCIENCES IN CANDIDACY FOR
THE DEGREE OF DOCTOR OF PHILOSOPHY

DEPARTMENT OF EDUCATION

1931

By
JOHN LEWIS BLAIR

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PREDICTING THE SUCCESS OF COLLEGE FRESHMEN

The theoretically complete investigation of college success will enumerate, in detail, the factors producing college success and will then construct measures demonstrably valid to measure these factors. This obviously smacks of the chimeral, however, and the college administrator must often rest content with the knowledge that a given item of information is or is not related to a given measure of college success, although he cannot know the causes underlying the measures used. He will, in short, use predictive servants (in estimating probable college success) whose family trees are dubious; but pending the genealogy he will not require a certificate of legitimacy--a statement of devotion to duty will suffice. It will be the purpose of this study to calculate the enthusiasm with which certain conceivably predictive measures devote themselves to the duty of forecasting college success.

This study is based upon the records of students entering Kent State College, Kent, Ohio, as freshmen during the Fall Quarters of 1928 and 1929. The population, whose distribution is shown in Table I, includes students in two-year curricula for elementary teachers as well as four-year college curricula. A large variety of information was secured for each of these students and the data obtained were analyzed to reveal possible relationships to

TABLE I
DISTRIBUTION, BY SEX AND CURRICULUM,
OF THE STUDENTS USED IN THE STUDY

Curricula	1928-1929			1929-1930		
	Men	Women	Total	Men	Women	Total
Two-Year	11	178	189	8	187	195
Four-Year	29	52	81	72	53	125
Totals	40	230	270	80	240	320

college success. The college evaluates student achievement according to the common system of A, B, C, D, F, which is interpreted numerically by allowing 4, 3, 2, 1, 0, quality points for each hour of work done with each respective mark. The measure of college success used in this study is the usual point-hour-ratio obtained by dividing the number of quality points earned by the number of hours undertaken.

The marking system appears to function at Kent with the mediocrity customary in colleges generally. The distributions of marks for separate instructors are hopelessly variant. The correlations between point-hour-ratios are approximately .66 for successive quarters. The fact that such conditions are but typical is not the least chastening of the influences which make for humility in the soul of the college educator.

Limitations of space do not permit us here fully to lay the ghost of Administrative Adjustment of Marks. It has been claimed that because the distributions of marks for different instructors are so variable, quality measures would be improved if quality points were assigned for a given mark according to the distribution of all marks of the instructor concerned; some have even claimed that the greatest improvement would occur if all instructors' differences were automatically removed by having the instructor rank his students instead of issuing a letter mark. Experimentation with the marks given to the students used in this study showed the futility of such adjustments. Point-hour-ratios based upon quality points assigned according to the instructor's distribution were virtually identical with unadjusted ratios (the correlations were .99 or higher) and the correlation of adjusted ratios for successive terms was no higher than that for unadjusted ratios. It is probable that the "adjustment" of an instructor's mark is mere hocus-pocus of administrative sorcery; improvement in marking must be made at the source of the marks!

1. Prediction from the Psychological Examination

The Ohio State University Psychological Examination was administered to all entering students in 1928 and 1929. The relationships between examination scores and first-quarter scholarship, presented in Table II, reveal that no

TABLE II

THE RELATIONSHIPS BETWEEN SCORES ON THE OHIO
UNIVERSITY PSYCHOLOGICAL EXAMINATION
AND FIRST-TERM COLLEGE SCHOLARSHIP

Test Number	Title of Sub-Test	Correlation between Scores and First-Term Scholarship		Multiple Correlation Coefficients
		1928	1929	1928
1.	Arithmetic Problems...	.397	.264	$R_{F.23} = .478$ $R_{F.25} = .484$ $R_{F.123} = .520$ $R_{F.125} = .522$ $R_{F.1235} = .530$
2.	Similarities-Opposites	.438	.445	
3.	Analogies.....	.424	.430	
4.	Number Progression....	.210	.280	
5.	Paragraph Reading.....	.447	.395	
Entire Examination....		.504	.488	

single sub-test is a satisfactory substitute for the whole examination but that the results obtained from any combination of two or more sub-tests except Test 4 compare favorably with those obtained from the whole examination.

Clearly, the examination, requiring a total time of one and one-half hours, could be approximately halved without marring its predictive validity.

In scoring the examination the number of errors and the number of items omitted in each sub-test, up to the last item answered, were calculated for each student. Data obtained from the use of these measures appear in Table III and demonstrate that the consideration of errors

TABLE III

THE RELATIONSHIP BETWEEN FIRST-TERM SCHOLARSHIP
AND VARIOUS TYPES OF SCORES ON THE
PSYCHOLOGICAL EXAMINATION, 1928

Type of Score on the Psychological Examination	Correlation with First- Term Schol- arship	Multiple Correlation Coefficients*
Number Right.....	.504	
Number of Errors.....	-.337	.541
Number Omitted.....	-.175	.507
Percent Right, of Number Answered (R+E)..	.490	.542
Number Tried (R+E+O)...	.505	.553

made does increase the correlation slightly but that the fundamental validity of the examination as a predictive instrument is not changed. This is true whether rights and errors are combined in a linear equation or to form a percentage measure of accuracy.

2. Prediction from High School Marks

The investigator who wishes to study the relationship of high school marks to college success has first to consider the problem of how to equate the high school marks, some of which will have been expressed in numbers or "per cents" and others in letters. A method commonly used is to transmute letter marks into supposedly equivalent

*The correlation of first-term scholarship and the combination of the number right with the measure indicated in the row.

number marks according to a preconceived plan. It was decided in this study, however, not to combine marks but to construct two sets of correlation tables, one to contain marks expressed in numbers, the other to contain letter marks placed upon a five-point numerical scale.

The results in 1928 were rather unexpected, in that the relationship between high school and college marks, shown in Table IV, proved to be much closer for averages expressed in terms of the number system of marking than for those derived from letter marks. The difference was

TABLE IV

THE RELATIONSHIP BETWEEN FIRST-TERM SCHOLARSHIP
AND VARIOUS AVERAGES OF HIGH SCHOOL MARKS

High School Marks Averaged	Correlation with College Marks			
	1928		1929	
	H. S. Marks in		H. S. Marks in	
	Number System	Letter System	Number System	Letter System
All H. S. Marks.....	.657	.438	.625	.585
Yearly Averages				
First Year.....	.691	.481	.552	.510
Second Year.....	.605	.441		
Third Year.....	.601	.406		
Fourth Year.....	.584	.453		
Departmental Averages				
English.....	.688	.425	.637	.586
History.....	.661	.430		
Science.....	.563	.368		
Foreign Language...	.553	.344		
Mathematics.....	.515	.420		
Commerce.....	.456			
Domestic Arts.....	.256			

sufficiently large, considering the size of the populations involved, to make it rather improbable that the variation could have been a matter of chance and to indicate the desirability of applying the same analysis to the 1929 group. The difference in 1929, while not so large as in 1928, is still in favor of the number system and emphasizes the desirability of maintaining the separate analysis.

The results of the 1928 analysis of yearly high school averages suggest that any yearly average is nearly, if not fully, as accurate a predictive index of college scholarship as the average based upon all high school work, and that the average at the end of the first year's work may be a slightly better index than the four-year average.

The nature of these results made it seem unnecessary to repeat the analysis except for the first year marks. The coefficients based upon first year marks are, in this case, slightly lower than those based upon the four years of work. On the basis of the analysis for the two years, however, we are justified in concluding that we can prophesy a student's probable college success as well at the end of his first high school year as we can by waiting for the composite average of four years work.

The results obtained from the analysis of departmental averages in 1928 indicate that averages of English marks and of history marks are superior to other departmental averages and that the English and history averages are at

least as good as the composite general average.

The intercorrelations of yearly and of departmental averages proved to be so high that there was no advantage to be obtained by combining these averages according to the multiple-correlation process. We may, therefore, conclude that it is unnecessary, and perhaps undesirable, to use all high school marks in predicting a student's college success. We can predict as well by using three or four marks in certain yearly or departmental combinations as we can by using all marks. The question immediately rises, therefore, as to whether we may not be able to find still more advantageous combinations of high school marks which will prove to predict college performance better than is done by the use of the average of all high school marks.

The correlation of marks in the various high school subjects with first-term scholarship appears in Table V. Subjects which do not appear in the table fall into two classes. First, those subjects which rarely appeared in the records of students were not included: such subjects as German, Spanish, English, History, and Trigonometry belong to this category. Second, the vocational and "special" subjects were not included: this exclusion affected Commerce, Domestic and Manual Arts, Art, and Music.

The populations involved in the 1928 groups are very small for several of the subjects, so that the values here

TABLE V

THE RELATIONSHIP BETWEEN FIRST-TERM SCHOLARSHIP
AND MARKS IN THE VARIOUS HIGH SCHOOL SUBJECTS

Subject	1928				1929			
	Number System		Letter System		Number System		Letter System	
	N	r	N	r	N	r	N	r
English I	154	.575	88	.516	213	.477	101	.500
II	157	.522	90	.421				
III	154	.543	88	.346				
IV	142	.560	78	.492	175	.561		
Latin I	116	.620	73	.343	170	.482	79	.411
II	100	.513	64	.377	150	.465		
III	28	.366						
IV	23	.387						
French I	50	.524	44	.304	82	.520	50	.536
II	40	.248	33	.165				
History Anc.	78	.278	46	.280				
Med.&								
Mod.	132	.544	66	.373	145	.528		
U.S.	153	.522	80	.431	177	.535		
Civics I	42	.520						
IV	107	.584	60	.312				
Economics	59	.536						
Sociology	40	.358						
Algebra Elem.	153	.468	81	.352	202	.445		
Adv.	57	.440	33	.173				
Geom. Plane	120	.420	67	.390	160	.390		
Solid	32	.489			55	.306		
Arithmetic	81	.380						
Gen. Science	123	.549	59	.298	157	.432		
Biology	92	.454	58	.357	111	.452	65	.363
Geography	79	.453	39	.259				
Physics	30	.503	30	.480	89	.531	38	.277
Chemistry	52	.661	27	.355	82	.485	44	.514

presented are not of great significance. We are not concerned, however, in the development of the exact relative significance of each separate subject. Our purpose is to determine from the 1928 group, the few subjects which show the closest relationship to college scholarship; and then to determine, for the students of 1929, the predictive significance of the average of the marks in this group of subjects.

Consideration of the 1928 data led to the selection of five subjects to be included in the tentative selective index. The subjects, listed below, include those yielding the highest coefficients in 1928 and provide for balance between the major academic departments of high school work. The subjects were as follows:

- English I
- English IV
- Latin I
- U. S. History and Civics
- Chemistry or Physics

The average mark of each student in these subjects was determined for the 1929 group. The correlation of this average with first term scholarship, presented in Table VI, indicates that the five-subject index is more closely related to scholarship than is the general high school average. It is obviously possible to select a relatively small group of high school subjects which will yield predictive results better than those obtained by the use of all subjects. This is significant for the college administrator who would operate his machinery of prediction

TABLE VI

THE RELATIONSHIP BETWEEN FIRST-TERM SCHOLARSHIP
AND THE AVERAGE MARK IN FIVE SELECTED
HIGH SCHOOL SUBJECTS

	1929	
	Number System	Letter System
Average in the five high school subjects.....	.677	.604
Average in all high school subjects.....	.625	.585

efficiently. It is not only labor-saving to use a few high school marks instead of many; it is productive of better results as well.

It did not seem necessary to re-calculate all correlation coefficients for the 1929 groups: it seemed sufficient to calculate the correlation for those subjects which showed closest relationship in 1928, to determine which subjects showed consistently high predictive value in both years.

On the basis of the 1929 results, it seems desirable that the tentative index be modified to include French I and Medieval and Modern History. In considering the results obtained in this study, it seems probable that an average based upon the subjects of this index will yield as accurate results as can be obtained from the use of high school marks.

We have already discovered that the score on the

TABLE VII

THE PREDICTIVE SIGNIFICANCE OF HIGH SCHOOL MARKS
IN COMBINATION WITH SCORES ON THE
PSYCHOLOGICAL EXAMINATION

Measures Correlated	Correlation High School Marks in	
	Number System	Letter System
First term Scholarship vs Psychological Examination (1928).....	.504	.504
General H. S. Average (1928).....	.657	.438
Psychological Examination vs General H. S. Average (1928).....	.486	.462
Multiple Correlation, First Term Scholarship vs Psych. Exam. & H. S. Average...	.690	.557
Multiple Correlation, First Term Scholarship vs Psych. Exam. & H. S. Average of the Five Subjects (1929).....	.699	.641

psychological examination correlated approximately .50 with first term scholarship and that this could be only slightly increased by a scoring method which took account of the number of errors made. It is clear, therefore, that the high school record is a better single index of college success than is the psychological examination. The data of Table VII, however, indicate that predictive accuracy is increased if the two are used in combination. We may hope, by this means, to obtain predictive coefficients in the neighborhood of .65 to .70.

TABLE VIII

THE PREDICTIVE SIGNIFICANCE OF THE GEORGE WASHINGTON
TEST OF SOCIAL INTELLIGENCE

Correlation of the Social Intelligence	
Test with	
First-Term Scholarship.....	.438
Psychological Examination.....	.706
General High School Average (Numbers).....	.371
General High School Average (Letters).....	.259
Multiple Correlations of First-Term	
Scholarship, and the Social Intelligence	
Test combined with	
Psychological Examination.....	.533
General High School Average (Numbers).....	.689
General High School Average (Letters).....	.552
Psych. Exam. and Gen. H. S. Av. (Numbers)...	.699
Psych. Exam. and Gen. H. S. Av. (Letters)...	.566

3. Prediction from Certain Published Tests

The George Washington University Test of Social Intelligence, a thirty-two minute test intended to measure the maturity and development of one's understanding of and response to social phenomena, was administered to the entire 1928 group. The data of Table VIII suggest the possibilities of this test in the prediction of college success.

The test, by itself, possesses a predictive accuracy slightly less than that of the psychological examination and much less than that of the predictive high school index. It is significant, however, that the social intelligence test and the high school record combined yield as good predictive results as the psychological examination

TABLE IX

THE RELATIONSHIP BETWEEN FIRST-TERM SCHOLARSHIP
AND SCORES ON CERTAIN PUBLISHED TESTS
AND QUESTIONNAIRES

Test	r
Watson Test of Public Opinion.....	-.158
Pressey X-O Test, Form A	
Total emotionality score.....	+.039
Deviation score.....	+.086
Colgate Personal Inventories	
B-2.....	+.003
C-2.....	+.082

and the high school record combined. This becomes particularly important when we remember that the psychological examination requires one and one-half hours as compared to the half-hour required for the social intelligence test. There seems to be no reason why the short social intelligence test might not properly supercede the longer psychological examination. Actually, the best procedure would probably be to combine the best predictive features of each into a new test.

Four additional published tests or questionnaires were administered to the 1928 students. The data of Table IX indicate that none of the scores on these tests can be used in the prediction of college success.

A detailed analysis of the predictive significance of the separate items of these tests was made, in which the responses of the fifty best students (based upon the point-hour ratio) were contrasted with those of the fifty poorest

students. The results of this analysis were uniformly negative for all tests. Very few items were answered differently by the good and the poor group. Those items in which the group reactions were different were presented to the 1929 students in a modified mimeographed questionnaire and the apparent differences evaporated completely. Apparently tests and questionnaires of this sort are not profitable in the prediction of a student's college success.

4. Prediction from Personal Ratings

The high school record blank, submitted as a part of each student's entrance credentials, provides, in addition to detailed information as to high school marks, a statement by the principal indicating whether the student stood in the upper, middle, or lower third of his graduating class; and a rating by the principal on ten personal traits.

The correlation between first-term scholarship and the student's tertile standing in his graduating class was .448 for the 1928 group and .466 for the group of 1929. This rating, by itself, is therefore practically as good a predictive index as the psychological examination. High school marks, however, are much more suitable predictive instruments.

The traits included in the principal's rating scale and their relationships to first-term scholarship are indicated in Table X. The data indicate that the rating of

TABLE X

THE RELATIONSHIP BETWEEN FIRST-TERM SCHOLARSHIP
AND PRINCIPALS' RATINGS ON CERTAIN
PERSONAL CHARACTERISTICS

Characteristics	Correlation with First-Term Scholarship		Corre- lation with Rating (b)
	1928	1929	
(a) Intellectual Capacity.....	.396	.491	.748
(b) Intellectual Performance..	.482	.581	---
(c) Originality.....	.319		
(d) Responsibility.....	.278		
(e) Evenness of Disposition...	.142		
(f) Leadership.....	.183		
(g) Popularity.....	.154		
(h) Health.....	.096		.284
(i) Industry in Studies.....	.433	.526	.726
(j) Partic. in Activities.....	.172	.269	.400

TABLE XI

THE PREDICTIVE SIGNIFICANCE OF THE RATING OF
INTELLECTUAL PERFORMANCE IN COMBINATION
WITH THE GENERAL HIGH SCHOOL AVERAGE

Correlation	1928		1929	
	Number System	Letter System	Number System	Letter System
First-Term Scholarship vs Gen. H. S. Average...	.657	.438	.625	.585
Gen. H. S. Average and Rating of Intel. Perform.	.661	.458	.663	.630

"Intellectual Performance" is the most significant and that little or nothing is to be expected from the combination of other ratings with this one. The performance rating is predictively as good as, and perhaps better than, the score on the psychological examination; a finding which must inevitably point toward the diminution of the significance of the examination.

The data of Table XI suggest that, under some circumstances the principal's rating of performance can be combined with high school marks to increase the predictive accuracy by a small amount. Apparently the ratings must themselves yield correlations in the neighborhood of .60 before they can be so used.

In analyzing the ratings an interesting phenomenon was noted; namely, that the principal's rating of performance is more closely related to first-term scholarship for the cases in which the performance rating is different from the ability rating than for the cases in which the two ratings are the same. These results appear in Table XII. The size of the coefficients suggests that a principal's rating of performance which differs from his rating of ability is almost, if not entirely, as good an index as the general high school average. A possible explanation of this situation lies in the suggestion that the cases in which the ratings were not the same are cases in which the ratings were more carefully made than usual. In any case, the results from the analysis of the rating

TABLE XII

THE RELATIONSHIP BETWEEN FIRST-TERM SCHOLARSHIP
AND THE PRINCIPAL'S PERFORMANCE RATING FOR
CASES IN WHICH THE PERFORMANCE RATING
DIFFERED FROM THE ABILITY RATING

Correlation between First-Term Scholarship & the Performance Rating	1928	1929	Combined
All cases.....	.482	.581	.529
Cases where the performance rating differed from the ability rating.....	.587	.696	.631

TABLE XIII

THE RELATIONSHIP BETWEEN FIRST-TERM SCHOLARSHIP
AND VARIOUS SCORES OBTAINED FROM THE
RATINGS OF GENERAL INTELLIGENCE

Rating Score	r
The average of three ratings.....	.410
Average of two lowest ratings of three.....	.482
Average of two in closest agreement.....	.431
Highest rating of the three.....	.226
Middle rating of the three.....	.447
Lowest rating of the three.....	.429
Single ratings by persons not teachers.....	.193
Single ratings by teachers.....	.442
Average of two teachers' ratings..... (N = 73)	.522

scale indicate that carefully made ratings by the principal are of extreme significance in the estimation of probable college success.

As a part of his application for admission to Kent State College, the student names three persons who may be used as references. At the opening of the Fall quarter in 1928, each of these references was asked to fill out an extensive rating blank. The blank consisted of a series of twenty-five personality traits to be rated upon a graphic scale of seven points. Analysis of these ratings indicated that single estimates were uniformly of low reliability and that none of the traits, except that of "general intelligence" bore any notable relationship to first-term scholarship. For 162 students, three separate ratings were obtained: the results obtained for these cases appear in Table XIII.

The customary procedure is to use the average of all ratings obtained: the results of this analysis, however, suggest the desirability of ignoring the highest rating of those obtained and using only the two lowest. The analysis also indicates the futility of using ratings by persons other than teachers. The size of the coefficients suggests that three ratings of general intelligence, all made by teachers, would provide a better predictive index than the psychological examination.

5. Prediction from the Application for Admission

As a part of his entrance credentials, the student submits a four-page Application for Admission of the type rather commonly used in American colleges. The blank provides for the following types of information:

- I. Personal and Parental.
Birthplace and date; parental ages, nationality and education; brothers and sisters; religion.
- II. Scholastic Interests.
School subjects easy, difficult, liked, disliked, studied hardest, with reasons; special honors; attendance; grades skipped or repeated.
- III. Extra-Curricular Activities.
High school literary, dramatic, public speaking, musical, athletic, social activities; religious activities; activities to be continued in college.
- IV. Recreational Interests.
Favorite recreations, books read, magazines and newspapers regularly read, accomplishment of greatest satisfaction.
- V. Vocational and Guidance Influences.
Vocational activities, summer occupations, influences governing choice of college.

The method here used was the detailed analysis of each item of the blank, to determine possible responses typical of above-average or of below-average students. On the basis of the analysis of the blanks submitted by the 1928 group a method of scoring was developed and applied to the blanks for the 1929 group. In general, in scoring the blank, each response to an item for which the average scholarship of the group so responding differed from the average scholarship of the whole population by more than .10 was scored ± 1 , depending upon whether the

group average was above or below the general average. In certain items for which the group average was widely variant from the general average, values greater than 1 were assigned. The score for the individual student is the algebraic sum of his scores on the separate items.

The item analysis is obviously incomplete and tentative since it is based upon only a few hundred college students in a single college year. The function of this study is not to determine the complete significance of any given item, but to suggest the possibilities of such an analysis of an information blank. This limited procedure obviously necessitates the hypothesis that a more extended analysis of items would result in much modification of the tentative analysis; but it is equally committed to the hypothesis that, if the limited procedure yields results of predictive significance, the significance will be increased by the extended analysis.

At the time the scoring method was developed, the 1928 blanks were scored and the results correlated with the point-hour-ratio for the first quarter. The data in the first column of Table XIV are the results of an analysis of a group applied to the group itself and, therefore, have no significance except to indicate the probable maximum agreement to be expected. Some shrinkage seems inevitable when an independent population is used. The results of the 1928 scoring amply justifies the application of the scoring method to the 1929 group. The 1929 results,

TABLE XIV

THE RELATIONSHIP BETWEEN FIRST-TERM SCHOLARSHIP
AND SCORES ON VARIOUS PORTIONS OF THE
APPLICATION FOR ADMISSION,
IN 1928 AND 1929

Portion of Blank	r		
	1928	1929	Loss
I. Personal and Parental.....	.369	.105	.264
II. Scholastic Interests.....	.564	.355	.209
III. Extra-Curricular.....	.472	.359	.113
IV. Recreational Interest.....	.417	.395	.022
V. Guidance Influences.....	.412	.229	.183
Entire Blank.....	.678	.512	.166

shown in the second column of Table XIV, are quite significant.

The relationship between the total score and scholarship, while less than that obtained for the high school record, is slightly better than that found in the use of the much-praised instrument, the psychological examination. We cannot, therefore, avoid the conclusion that the Application for Admission is in itself as significant a predictive instrument as the psychological examination.

The loss of significance, when the scoring method is applied to an independent group, varies for the separate portions of the blank. The apparent significance of the personal and parental information is nearly all dissipated;

but the shrinkage for recreational interests and extra-curricular activities is very small.

It will be immediately suggested that the loss of significance is largely due to the method of scoring; i.e., that the scoring method included many small, accidental differences which would not hold in a new group; so that their inclusion would inevitably reduce the correlation coefficient for a new group. Had we used only the more statistically significant differences, our results in 1929 would more nearly have approximated those of 1928.

To test the validity of this suggestion the blanks of 1929 were rescored, using only those responses to an item for which the differences in 1928 between the average scholarship of the group so responding and the total population were in excess of .30. In this manner many of the original items were omitted and those remaining were the ones of most nearly complete statistical significance. The results of this analysis appear in Table XV.

We see, first, that the score obtained by Method Y is as highly correlated with scholarship as was the score obtained by the original method. The first reaction to this finding might be the conclusion that, as the two coefficients are virtually identical, there is no purpose in using the more laborious method. The multiple coefficient of scholarship with Methods Y and Z, however, is larger than the correlation for Method X, indicating that the less significant items should be included to reap the

TABLE XV

THE COMPARATIVE SIGNIFICANCE OF METHODS OF
SCORING THE APPLICATION FOR ADMISSION

Scoring Methods:

X--The original method

Y--Using only the more significant items

Z--Using only the less significant items

Measures of Relationship:

$$r_{FX}=.512$$

$$r_{FY}=.515$$

$$r_{FZ}=.371$$

$$r_{F.YZ}=.540$$

$$r_{F(X+Y)}=.537$$

full advantage. The X-score, therefore, contains the right ingredients but the recipe is wrong. We need more weight given to the items which are of greater statistical significance.

It is to be noted that the addition of the Y-score to the X-score yields a correlation coefficient virtually identical with the multiple coefficient. The data, therefore, suggest that the more significant items should be given twice the weight they received in the original scoring.

The correlation between the score on the application blank and the general high school average proved to be satisfyingly low ($r = .429$), and it is also low between the application score and the psychological examination ($r = .341$); so that the application for admission is significant for prediction, in combination with these measures.

When the application score is combined with the high school record the multiple coefficient is raised to .681; when the psychological examination is added to these, the multiple correlation rises to .702.

Clearly, therefore, the Application for Admission is a worthy instrument for the college predictor; and its more exhaustive analysis and revision is most heartily to be recommended.

6. Prediction from other Supplementary Information

A questionnaire on recreational interests was administered to the 1928 students. This questionnaire consisted of a list of eighty-five recreational activities to be rated by the student according to his like or dislike of the activity. The student registered extreme liking by marking +3 before the item and extreme dislike by writing -3, with such intermediate responses as he desired. A response of 0 indicated an attitude of complete neutrality. In analyzing the data, the responses of the fifty best students were compared with those of the fifty poorest.

Of the eighty-five items, fifteen related to reading. Most of the reading activities listed were of the lighter, leisure type and did not, in general, show a great deal of discriminatory power. The average interest score was higher for good students in response to society stories, humorous magazines, and historical novels: for all other types the interest scores of good and poor could not be distinguished.

The relative ranking of the fifteen reading items, however, suggests that intellectuality of interest is a criterion on college prediction. Among the fifteen items, those which were ranked at least four levels higher by the good than by the poor students were historical novels, humorous magazines, fashion news, and love stories; those which are ranked four levels higher by the poor group include sport magazines, sport news, war stories, and comic strips. The most cogent illustration of the probability that intellectuality of interest is a predictive factor is found in the fact that after the Bible, ranked first in both groups, the favorite reading of the low group is the comic strip, whereas the high group prefers the historical novel to all other types listed.

It is probable that the inclusion of a few reading types of the study-form would have made the place of intellectuality of interest more noticeable.

The eleven items which related to music interests show the intellectual interest clearly. We find the violin, the opera, and the classical form generally, ranked relatively higher by the good group; and we find jazz and the comic song to be the greater favorites of the poor group. Most noticeable, however, is the fact that while the poor group places the comic song third in interest among the eleven musical items, the good group places it tenth!

In the thirteen items relating to the watching of

athletic sports, the only discrimination is noted in the case of boxing, which is definitely a greater favorite with the poor group. Similarly, the eleven items relating to the performance of outdoor recreational activities yielded nothing of discriminatory value.

In the eleven activities relating to participation in indoor games, we find croquet, five hundred and Michigan to be the relative favorites of the high group; while checkers and rhum form the joys of the low group.

The interests relating to the theater and the moving picture reveal again the place of the intellectual interest. The good group prefers the theater play and Shakespeare; the low group inclines toward the movie comedy and the blackface comedian.

Of the remaining activities no distinction is noted except that the working of cross-word puzzles is an interest of the good rather than the poor group.

The questionnaire as it was used in this study merits no more detailed attention than has been here given: it has served its purpose, however, in revealing intellectual-ity of interest as a genuine factor in the prediction of college success. It is probable that a questionnaire, or better, an objective test of recreational activity, constructed and scored on the basis of many experimental forms and analyses could be made to yield relatively high correlation with scholarship. Certainly this source of information holds forth much promise to the college administrator

and merits further attention and research.

A Misconceptions Test, consisting of forty false items erroneously considered true by many people, was administered to the students of the 1928 group. Analysis of the results, by the method of high and low groups, revealed very little discrimination: the test is, at best, of very minor importance in prediction of college success. One may regret that the average student regards nearly half of the items on the list as true, in defiance of scientific habits of thinking, but the predictor of college scholarship recognizes that as long as the distressing situation holds for good and poor students alike, the material is not of significance to him.

A further questionnaire was administered to the 1928 group, in this instance containing items relating to the social and economic status of the student. Its purpose in this study was to determine whether the economic and cultural circumstances of the student's home are significant factors in estimating the student's probable college accomplishment.

Analysis of the items of the blank revealed a virtually ubiquitous absence of significance. Almost without exception the average scholarship of students making any given response to any given item was practically the same as that for the entire population.

The Health Office of the college gives each student a physical examination and secures information on a Score

Sheet for Health Habits and Conditions. Health scores obtained from this source proved to be totally uncorrelated with first-term scholarship. Analysis of the items of the sheet re-emphasized the insignificance of this source as a predictive agent, as practically no items distinguished in any manner between good and poor students. Curiously enough, in the few items which did distinguish the two at all, the low student tended to make the better health score.

The findings do not, of course, imply that the physical condition of a student does not affect the quality of his college work. They do, however, show clearly that differences in health conditions of the type contained in the health blank are not of general importance in the determination of college scholarship.

7. The Prediction of First-Year Scholarship

The preceding discussions have concerned themselves with the possibilities of various measures and sources of information in the prediction of the scholarship of students during the first quarter of attendance. It will now be appropriate, however, to inquire into the effectiveness of these measures in predicting the student's scholarship for his first year.

Table XVI indicates the relationships between various measures of the student and his point-hour-ratio for the first year, as compared with the relationships between the

TABLE XVI

THE SIGNIFICANCE OF CERTAIN MEASURES IN PREDICTING
SCHOLARSHIP FOR THE FIRST COLLEGE YEAR AS
COMPARED TO THEIR SIGNIFICANCE IN
PREDICTING FIRST-TERM SCHOLARSHIP

Measures correlated with Scholarship	1928--1929		1929--1930	
	Fall	Year	Fall	Year
1. Psychological Examination..	.504	.510	.488	.491
2. High School Gen. Average:				
Number Systems.....	.657	.722	.625	.631
Letter Systems.....	.438	.548	.585	.599
3. The Application for Admission.....			.512	.514
4. Multiple correlation:				
Psy. Ex. & H. S. Av.,				
Number Systems.....	.690	.745	.660	.667
Letter Systems.....	.557	.618	.630	.641
App. for Adm. & H. S. Av.,				
Number Systems.....			.681	.686
Letter Systems.....			.654	.668
5. Multiple correlation:				
Psy. Ex., Applic. for Adm.				
& H. S. Av.,				
Number Systems.....			.702	.706
Letter Systems.....			.679	.693
Standard Deviations of Point- Hour Ratios.....	.70	.61	.72	.62
Standard Errors of Estimate, from the coefficients in 5, above,				
Number Systems.....			.51	.44
Letter Systems.....			.53	.45

same measures and his first-term ratio. The data show clearly that the problems involved in yearly prediction are essentially the same as those met in the prediction of quarterly scholarship. The coefficients of correlation involving yearly scholarship are all very slightly in excess of the corresponding coefficients involving first-term scholarship. It is clear, therefore, that the measures which predict first-term scholarship most efficiently will also be effective in the prediction of success for the entire year.

It is seen, by comparison of the standard deviations of the scholarship measures, that the yearly point-hour-ratios are less variable than those based upon the first quarter only. Because of this diminution of variability we are able to predict the yearly point-hour-ratio with less numerical error than we can the quarterly ratio, even though the correlation coefficients are not different.

It is not proper, of course, to state that we can predict yearly scholarship more accurately than we can first-term scholarship, because it is a fact that the predictions of yearly scholarship will result in as much displacement of students among themselves as the predictions of first-term scholarship. Our numerical error is diminished merely because point-hour-ratios based upon a year's work are not, strictly speaking, comparable to those based upon the work of one quarter, because of the difference in variability.

The magnitude of the standard errors of estimate indicates that approximately two-thirds of the students will be predicted within one-half unit of their actual attainments: our instruments of prediction, therefore, enable us to predict the performances of the majority of students within the accuracy demanded by practical necessity. On the other hand, the fact that the predictions for one student out of three will be more than half a unit awry must cause us to be wary in our administrative interpretation of any individual estimate.

8. Prediction after the first quarter

We have been concerned, up to this point, with the problems involved in predicting the success of the student at the time he enters upon his college career. We have found, not unexpectedly, that the actual performances of some students will deviate considerably from the estimates made at the time the student entered. It, therefore, becomes appropriate to inquire into the possibilities of prediction, after the student has completed a period of college study, of what he will do thereafter.

Table XVII presents the relationship between the point-hour-ratio for the Winter quarter and various predictive measures previously used in the study. The data indicate that the general high school average can be used with the point-hour-ratio for the Fall quarter to increase the predictive accuracy slightly over that possible with

TABLE XVII

THE RELATIONSHIPS BETWEEN CERTAIN PREDICTIVE
MEASURES AND THE POINT-HOUR-RATIO
FOR THE WINTER QUARTER

Measures correlated with Winter scholarship	Correlation	
	1928-29	1929-30
1. Point-hour-ratio, Fall quarter.....	.665	.669
2. Psychological Examination.....	.447	.453
3. Gen. H. S. Aver., Number System.....	.642	
" " " " Letter System.....	.427	
4. The Application for Admission.....		.509
Multiple coefficients of correlation:		
5. Fall Ratio and Psychological Exam...	.678	
6. Fall Ratio and H. S. Average--		
Number Systems....	.718	.720
Letter Systems....	.682	
7. Fall Ratio, H. S. Aver. (Number		
Systems) and the Applic. for Admis..		.738
8. Fall Ratio, H. S. Aver. (Number		
Systems) and the Psych. Exam.	.721	

the Fall ratio alone. With these two measures we can predict Winter scholarship with slightly greater accuracy than we could predict Fall scholarship from the high school average.

We previously found that we could use the psychological examination in combination with the high school record to increase slightly the accuracy of our prediction of Fall scholarship over that possible with the high school record alone; Table XVII, however, indicates that the addition of the psychological examination to the Fall ratio and the high school average will not produce greater accuracy in the prediction of Winter scholarship. It seems,

therefore, that the predictive significance of the psychological examination is largely limited to the first quarter of the student's attendance: after that time the available direct measures of college performance supercede it.

The score on the Application for Admission, however, seem to retain some significance in the predictive field after the first quarter. The increase in the predictive coefficient when the score is combined with the Fall ratio and the high school average is very slight (.018) and it is possible that it will not be maintained in further analyses; nevertheless, the data suggest the desirability of taking this score into account after the first quarter.

Table XVIII indicates that prediction of Winter scholarship from the Fall ratio can be made much more accurately for students in four-year curricula than for those in two-year. Inspection of the administrative organization of these curricula at Kent State College suggested the possible explanation. In the four-year curriculum, the student tends to continue in the same department and with the same instructors; whereas in the two-year curriculum the student rarely has the same instructors for two successive quarters and frequently has work in entirely different departments. The greater agreement of scholarship scores of four-year students may therefore be due to greater continuity of subject-matter and instructional guidance.

TABLE XVIII

THE CORRELATION BETWEEN FALL AND WINTER SCHOLARSHIP
FOR STUDENTS CLASSIFIED ACCORDING TO CURRICULUM

Classification	1928-29	1929-30
Four-Year Curricula.....	.725	.791
Two-Year Curricula.....	.627	.566
All Students.....	.665	.669

Analysis of marks given in successive quarters showed this to be the case. The correlation between successive marks given by the same instructor was .596; the correlation between marks given in the same department but by different instructors was .427; that between marks given in different departments by different instructors was .314. Clearly, point-hour-ratios will be in closer agreement the more they are based upon similarity of content and instructional presence.

This discussion is of fundamental importance in demonstrating that predictive practices based upon previous college performance must take into account the similarity of the future program to the program of the past. Appropriate use of this principle in the determination of predictive estimates can be expected to increase the general accuracy of our predictions and, more importantly, can indicate those predictions in which we can place the most confidence.

Administratively it may often be important at the end

of the first quarter to predict the students general average for the first year as well as to estimate his probable accomplishment during the next succeeding quarter. The possibilities in such prediction are indicated in Table XIX.

It was to be expected that the point-hour-ratio for the Fall quarter should be highly correlated with the ratio for the year, as the yearly measure is in part based upon the same data as the quarterly figure. The chief interest lies in noting that the added significance of the measures available at the beginning of the Fall quarter is now very slight. The use of the high school record adds not over one or two points to the predictive coefficient, whereas the further addition of the psychological examination or the application for admission does not make for greater accuracy of prediction.

TABLE XIX

THE PREDICTION OF YEARLY SCHOLARSHIP, AT THE COMPLETION OF THE FIRST QUARTER

Measures correlated with Yearly Scholarship	Correlation	
	1928-29	1929-30
Point-hour-ratio, Fall Quarter.....	.822	.866
Multiple coefficients:		
Fall Ratio and H. S. Average,		
Number Systems.....	.857	.874
Letter Systems.....	.848	.873
Fall Ratio, Psych. Exam., and		
H. S. Aver.,		
Number Systems.....	.859	
Letter Systems.....	.849	
Fall Ratio, Applic. for Admission		
and H. S. Aver., Number Systems....		.876
Letter Systems.....		.875

9. Prediction of Success in Specific Subjects

No attempt will be made in this study to determine through exhaustive analysis the most efficient measure for the prediction of success in each individual subject of the college curriculum: such a determination for even a single subject would demand an extensiveness of data and entail a magnitude of labor beyond the scope of this investigation.

Our analysis within this field will limit itself to a study of the relative effectiveness of certain measures already used in the prediction of general success, when they are applied to the separate college subjects. An additional objective will be to determine the accuracy with which prediction of general success can be made through the use of predictions of success in each college subject. To speak more concretely, we shall first analyze the group of 1928 to determine the relationship between such measures as the psychological examination or marks in specific high school subjects, and the marks earned in the separate college subjects taken: from these correlations we shall indicate the measures which appear to predict success best in each subject. On the basis of these results a prediction will be made of the probable success of the 1929 students during the Fall quarter, to give some indication of the possibilities in general prediction from subject prediction.

TABLE XX

THE CORRELATION BETWEEN MARKS IN SPECIFIC COLLEGE
SUBJECTS AND CERTAIN PREDICTIVE MEASURES

College Subject	Psych. Exam.	H.S. Gen. Av.		H.S. Eng. Av.		Miscellaneous	
		Number System	Letter System	Number System	Letter System	Number System	Letter System
Four-Year Curriculum ^(a)						English I	
Eng. Grammar	.587	-----	-----	.604	.559	.645	.427
Eng. Comp.	.429	-----	-----	.464	.348	.443	.292
						Science Av.	
Gen. Biology	.591	-----	-----	.698	.594	.450	.546
						History Av.	
Eur. History	.387	-----	-----	.675	.536	.729	.593
Two-Year Curriculum ^(b)						English I	
Gen. Psych.	.533	-----	-----	.553	.547	.447	.323
Eng. Methods	.130	-----	-----	.455	.192	.429	.149
						Science Av.	
Agriculture	.152	.374	.323	-----	-----	.444	.212
Physiology	.029	.442	.147	-----	-----	.299	.103
Child Hyg.	.039	.264	.060	-----	-----	.202	.074
Geography	-.040	.232	.565	-----	-----	.260	.368
						Math. Av.	
Arithmetic	.347 ^(c)	-----	-----	-----	-----	.450	.067
Pub.Sc.Music	.528	.486	.230	-----	-----	-----	-----
Art	.163	.153	.141	-----	-----	-----	-----

(a) Other subjects were taken in too few cases to permit the significant determination of correlation.

(b) English Grammar and Composition were taken by students in both two-year and four-year curricula.

(c) The correlation between the arithmetic grade and the score on the arithmetic test of the Psychological Examination was, $r = .474$.

The relationships between individual college marks and the various predictive measures appear in Table XX. The most noticeable general feature is the variation disclosed in almost any form of comparison of the tabled figures.

The psychological examination is seen to be extremely variable in its effectiveness for various subjects. In four cases the correlations are higher than the correlation between the psychological examination and general first-term scholarship, whereas in six other cases the coefficients do not materially depart from zero. It is significant to note that the abilities measured by the psychological examination are totally unessential to success in some college subjects.

It is also significant to note that the subjects in which the psychological examination does not predict success are subjects in the two-year curriculum and, further, are subjects professionalized in content and method for the elementary teacher. It is of further interest to note that this situation also holds, to some extent, for the relationship of high school marks to individual college marks. High school marks or averages which are relatively satisfactory in prediction can be found for each of the four-year subjects, but for many of the two-year subjects there appears to be no combination of high school marks which can be used to estimate probable success with any degree of satisfaction. The data point conclusively to the need of intensive study within certain of these fields

to determine just what abilities are related to success in the field and to develop measures which will be more closely related to marks in these fields.

On the basis of the findings for 1928, regression equations were developed for each subject, using those measures which were most closely related to the 1928 marks. The equations represent the best means available after one year of analysis for predicting success within the given field, but they probably do not represent the final or fundamental means of prediction and are, therefore, not reproduced here. On the basis of these equations, however, an anticipated number of quality points was determined for each subject carried by each student in the 1929 group. Addition of these anticipations for each student, and division by the number of hours registered yielded the student's estimated point-hour-ratio for the Fall quarter. The correlation of these estimates with the actual ratios obtained gives an indication of the possibilities in a one-year analysis and may suggest the probability of increased accuracy through the perfection of the method.

These coefficients, presented in Table XXI, are seen to be slightly higher than any corresponding zero-order coefficients obtained in previous sections of this study. The highest coefficients previously obtained were those involving the predictive high-school index of five subjects, reaching .604 where the high school marks were given in letters and .677 where the marks were in numbers. At the

TABLE XXI

THE CORRELATION BETWEEN FIRST-TERM SCHOLARSHIP IN 1929
AND THE PREDICTION OF GENERAL SCHOLARSHIP BASED
UPON THE PREDICTIONS FOR SPECIFIC SUBJECTS

Student classifications	r
Classed by Curricula:	
Four-Year.....	.670
Two-Year.....	.700
Classed by High School Record:	
Number Systems.....	.689
Letter Systems.....	.640
All Students.....	.675

TABLE XXII

THE PREDICTIVE SIGNIFICANCE OF COMBINATIONS OF THE
ESTIMATE BASED UPON PREDICTION IN SPECIFIC
SUBJECTS WITH VARIOUS OTHER
PREDICTIVE MEASURES

Measure Combined with the Predictive Estimate	Correlation with the Predictive Estimate	Multiple Correlation with Fall Scholarship
Psychological Examination.....	.620	.681
General H. S. Average		
Number Systems.....	.832	.690
Letter Systems.....	.802	.641
Application for Admission.....	.479	.708

same point, however, we found that the combination of the selective high school index and the psychological examination yielded multiple coefficients almost identical in amount with those given in Table XXI. As the predictive measures for specific subjects were obtained exclusively

from the psychological examination and the high school record, this identity is not surprising.

The data of Table XXII indicate that the further use of the psychological examination and the general high school average in combination with the general prediction from specific predictions does not result in greater predictive accuracy. Evidently the method by which the examination and the high school record were used in the prediction of success in specific subjects has exhausted the predictive significance of these measures.

The Table indicates, however, that the score on the application for admission can be used with the predictive estimate, for an increase in accuracy, as the coefficient is thus raised from .675 to .708.

Table XX indicated that individual predictions were, in general, less satisfactory for two-year subjects than for four-year subjects: Table XXI, however, indicates that predictions of general success based on the data of Table XX are slightly more accurate for two-year students than for four-year. A probable explanation of this apparent anomaly is that all two-year students took General Psychology and Freshman English, for which the individual predictions are relatively satisfactory, so that not more than half the program of any student is subject to the relatively inaccurate individual prediction. Furthermore, the low correlations of some of the subjects in Table XX led to regression lines with little or no slope with the

result that the predictions were all relatively close to the Mean, were approximately constant for each student, and thus had little weight in determining the correlation coefficient.

Whatever the explanation, the data suggest, interestingly enough, that the failure to predict a portion of a student's program accurately may not be serious in the prediction of his success in general. The interpretation, very likely, is not as broad as this. Undoubtedly the use of additional measures which would accurately predict the now unpredicted subjects will produce an increase in general predictive accuracy, but the increase will probably be less than might have been expected from a priori considerations.

Prediction of general success from predictions of success in specific subjects seems, in conclusion, to be justified, since it results in slightly increased accuracy even with the inadequate specific predictions used in this study. It would, therefore, seem important to investigate the possibilities of prediction in the separate subjects, particularly those which are so inadequately predicted from the instruments herein employed. Such research can be expected to aid in clarifying the problems relative to the subject concerned and is very likely to prove essential to the future development of general prediction.

10. Conclusions and Interpretations

This study has demonstrated that the high school record is the best single predictive index among the various measures analyzed. This finding may not hold for some colleges to which students come from high schools widely scattered throughout the country, but it is probable that the situation will obtain for the majority of colleges which draw their students from restricted geographical areas. The importance of giving further attention to high school marks cannot, therefore, be overestimated.

This study suggests the probability that high school marks issued according to the number of "percentage" system are more predictive than those issued in letters. The existence of this difference should be more thoroughly checked and its causes determined. The present study inclines one to the suggestion that this difference may be due to lesser uniformity in the interpretation of a letter system from school to school rather than to any diminution of carefulness in marking where letters are used: this suggestion, however, remains tentative and dependent upon the verdict of further research directed specifically toward this problem.

This study has suggested that the best predictive results are obtained by the use of a few selected high school marks rather than the use of an average based upon all marks earned in high school. It is important,

therefore, that the general predictive significance of each high school subject be scrutinized to determine whether the high school index as finally determined in this study should be revised in any manner.

The study finds that the psychological examination, the most commonly used instrument of prediction, does possess a predictive significance and that its use in combination with the high school record results in increased accuracy; but it also finds the predictive significance of the examination to be no greater than that of any one of several other measures which are readily made available. The study, therefore, suggests that the examination in its present form might be abandoned without serious loss to college administration.

The study also found, however, that the psychological examination could be materially reduced in working time without reducing its predictive significance: it also found that some of the material of the Social Intelligence Test was predictively significant even after the high school record and the psychological examination had been taken into account. From these findings grew the suggestion that a disposition of the psychological examination more desirable than its total dismissal would be its radical revision to include less material of the type now found in it, the displaced material to be replaced by material of the type found in the social intelligence test. Possibly other types of material could justifiably be

included. It, therefore, becomes the duty of future study to determine the appropriate form of a revised examination which will be of maximal significance. It will be the task of such an investigation to determine factors related to college scholarship which are at the same time as unrelated as possible to high school marks, and then to devise appropriate test-forms into which the useful material can be cast.

The study has found that ratings of intellectual ability and performance, made by principals and teachers, have as high predictive significance as the present psychological examination and under certain circumstances may possess nearly the significance of the general high school average. It, therefore, becomes important to study the possibilities of improving such ratings and the desirability of securing teachers' ratings of other specific characteristics. The investigation should determine methods whereby teachers can make ratings which are comparable, and should discover methods whereby the teacher can be convinced of the importance of the rating blank so that she will make her ratings carefully and in an unbiased manner. If these difficulties can be solved, the rating blank will earn a favored seat in the predictive jury.

The study finds that ratings made by persons other than teachers have little or no significance, and future investigations are hereby discouraged from the use of

such estimates.

The study finds that the Application for Admission, in its present form and scored upon the basis of an analysis which is tentative and inevitably inaccurate at certain points, is nevertheless of slightly more predictive significance than the psychological examination. The utmost encouragement is, therefore, given for future investigation to determine with greater exactitude the significance of items now included in the blank and to determine other material which can and should be included. Future research should at the same time determine whether certain of the material now included within the blank cannot be cast in objective test form and incorporated in the revised psychological examination.

The study finds that the items of the Watson Test of Public Opinion, the Colgate Personal Inventories, the Pressey X-O Tests, the socio-economic questionnaire and the Health Score Sheet have little or no predictive significance. The suggestion for future study is that this material be avoided and that time be spent at points of greater promise.

The study finds student's reports of recreational interests to be of significance in the prediction of success. Future investigations should, therefore, develop test-forms for materials of this sort including the specific content which is finally revealed as the most significant for predictive purposes.

The study finds that prediction of general success by means of prediction of success in specific subjects is slightly more accurate than prediction of general success directly through extraneous measures, in spite of almost total inaccuracy in the prediction of success in some specific subjects. Future investigation should, therefore, devote itself to the problem of prediction in specific fields, especially in those fields where the inaccuracy of present prediction is greatest.

The highest correlations obtained in this study are slightly above .70. This degree of relationship between the prediction and the actuality is in agreement with the best results announced in a few similar studies and is considerably higher than the results commonly found in the literature of prediction. From this point of view we may presume to be satisfied with our results since they indicate an accuracy of prediction rarely equalled and not exceeded in the experience of other investigators in other colleges.

Consideration of the properties of the correlation coefficient and the standard error of estimate, however, dispels any complacency which might have been engendered by such empirical comparisons. For it was previously pointed out that, while predictions based on coefficients in the vicinity of .70 will be accurate within the limits of practical necessity for the majority of students, the predictions for some students will be seriously inaccurate.

